TREK

HOSC Payload Ethernet Gateway (HPEG)

TUTORIAL

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TABLE OF CONTENTS

FIGURES

1   Welcome

The Telescience Resource Kit (TReK) is a suite of software applications and libraries that can be used to monitor and control assets in space or on the ground. The TReK HPEG application provides the capability to access the Huntsville Operations Support Center (HOSC) Payload Ethernet Gateway (HPEG) service.

This tutorial provides step-by-step instructions describing how to perform common application functions.

This tutorial uses screen dumps taken on a Windows computer. However, the steps are the same regardless of whether you are running on Windows or Linux.

2   Technical Support

If you are having trouble installing the TReK software or using any of the TReK software, please contact us for technical assistance:

TReK Help Desk E-Mail, Phone & Fax:

E-Mail: trek.help@nasa.gov
Telephone: 256-544-3521 (8:00 a.m. - 4:00 p.m. Central Time)
Fax: 256-544-9353

If you call the TReK Help Desk and you get a recording please leave a message and someone will return your call. E-mail is the preferred contact method for help. The e-mail message is automatically forwarded to the TReK developers and helps cut the response time. The HOSC Help Desk (256-544-5066) can provide assistance as needed and is available 24x7.

3   Introduction

The TReK HPEG application provides the capability to access the Huntsville Operations Support Center (HOSC) Payload Ethernet Gateway (HPEG) service. The HPEG service provides access to payloads onboard the International Space Station (ISS) using standard network protocols and services. Services supported include:

 ➢ Ping over ICMP
 ➢ Hypertext Transfer Protocol Secure (https) over TCP on port 443
 ➢ Remote Desktop (rdp) over TCP on port 3389
 ➢ Secure Shell (ssh) over TCP on port 22
 ➢ CCSDS File Delivery Protocol (cfdp) over UDP on port 4560
 ➢ Delay Tolerant Network (dtn) over TCP on a configured port

Note: In the event this list does not match the Payload to Generic User Interface Definition Document (PGUIDD) SSP 50305, the information in the PGUIDD takes precedent.

Access to these services is based on HOSC account privileges.

The general sequence of events when using HPEG is as follows:

> Establish VPN session with HOSC.
> Establish a Login Session with the HOSC using the TReK HOSC Login application.
> Start the TReK HPEG application.
> Push the Configure button to configure the application.
> Push the Activate button to activate the HPEG service.
> Once the HPEG service is active, start a session with your destination (payload).
> Use the Ground Proxy IP address returned to communicate with your payload using other products such as the TReK CFDP application, Remote Desktop, a console command line to ssh, etc.
> When finished Deactivate and Exit.

The interface between the TReK HPEG application and the HOSC is shown in Figure 1.
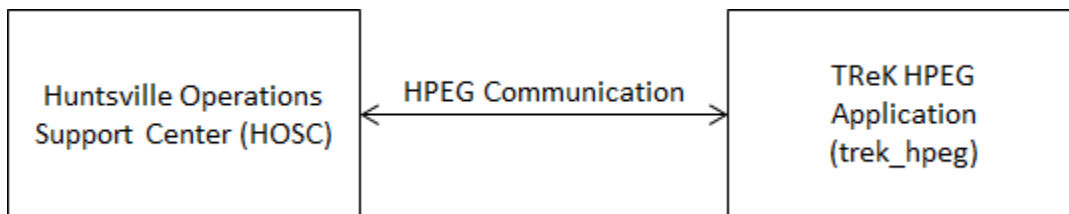

Figure 1 TReK HPEG/HOSC Communication

Figure 2 shows the standard IP communication that is possible between ground applications and flight applications once HPEG services have been started.
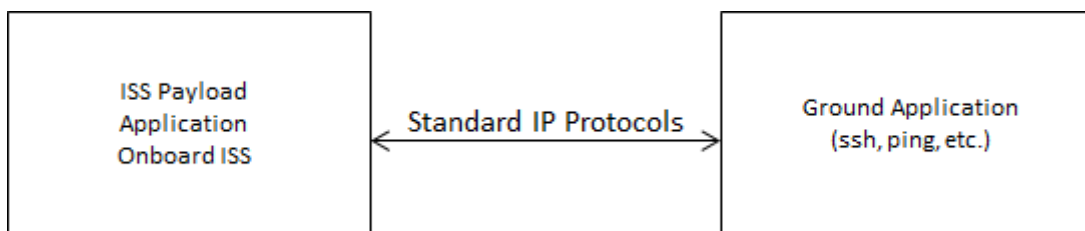

Figure 2 Standard IP Communication

2

4 Overview of the User Interface

4.1 Main Window

The main window is shown in Figure 3. The Message area is a dock window that you can float or dock. To float a dock window, use your left mouse button to click and hold the title area while dragging the window to another area of the screen. To dock, use the title bar to drag the dock window over the main window and drop.
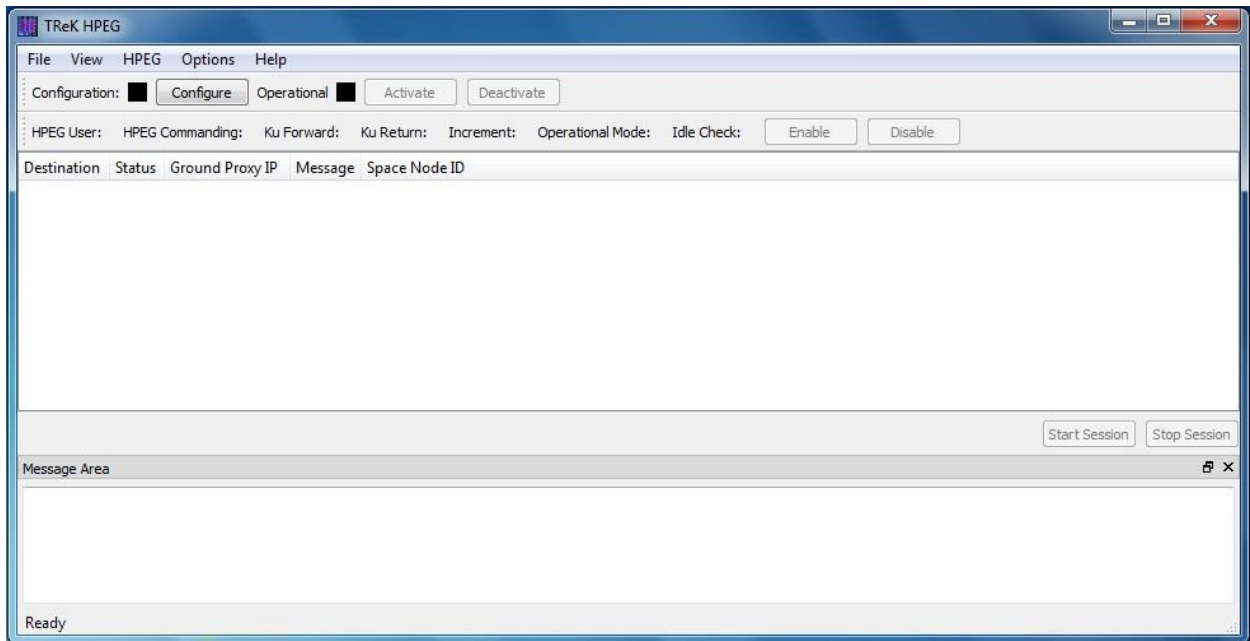

Figure 3 Main Window

Configuration Toolbar
The Configuration toolbar at the top of the window provides quick access to configure the application, activate, and deactivate the HPEG service.

HPEG Toolbar
The HPEG toolbar (located under the Configuration toolbar) provides quick access to HPEG Status and Configuration information. It also provides the capability to Enable and Disable the HPEG Idle Check capability.

Ground Node ID Toolbar
The Ground Node ID Toolbar (located under the HPEG toolbar when displayed) provides quick access to the Ground Node ID. If you do not have a Ground Node ID assigned, this toolbar will not be displayed. The Ground Node ID toolbar is only displayed when the HPEG service is active and a Ground Node ID is in use. This toolbar will also display Delay Tolerant Network information if you have access to this service.

HPEG
The HPEG area provides a list of "Destinations" onboard ISS you are authorized to access through the HPEG. Typically you will have one destination in the list – your

payload. The HPEG area also provides "Start Session" and "Stop Session" buttons to start and stop an HPEG session for a selected destination. If you are authorized to use the CFDP service or the DTN service, you will be assigned a Ground Node ID, and your payload onboard will be assigned a Space Node ID. These IDs correspond to CFDP Entity IDs (EIDs) needed by the CFDP protocol and the DTN node number when using DTN. If you are authorized to use the CFDP service or DTN service, you will be prompted to select your Ground Node ID during HPEG activation. It is possible to have more than one Ground Node ID assigned. In this case you will be prompted with a list and can select the Ground Node ID you would like to use for the session. If you are not authorized to use the CFDP service or the DTN service, you will not be prompted for a Ground Node ID and the Space Node ID field will always be empty.

If you are authorized to use the CFDP service or DTN service, you must select a Ground Node ID when prompted. If you select a Ground Node ID that is in use, you will be prompted again. If all Ground Node IDs are in use, you will need to free one of the Ground Node IDs so you can select one that is available or cancel the activation.

Message Area
The Message Area displays important information, warning and error messages. The message area can be cleared using the View menu.

4.2   Toolbars

There are three toolbars: Configuration, HPEG and Ground Node ID. The Configuration toolbar provides visual information about the state of the application and provides access to common application functions. The HPEG toolbar provides HPEG Configuration and Status information. The Ground Node ID toolbar provides access to the Ground Node ID selected during activation and DTN configuration information if you are authorized to use the DTN service.

4.2.1   Configuration Toolbar

The Configuration toolbar is shown in Figure 4. It can be used to configure the application, activate the HPEG service, and deactivate the HPEG service.
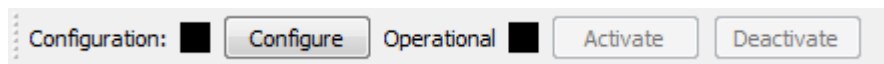

Figure 4 Configuration Toolbar

Configuration Status
When the Configuration status is black, this indicates the application has not been configured. When the Configuration status is green, this indicates the application has been configured and the HPEG service can be activated.

Use the Configure button to access the Configuration dialog to configure the application.

Operational Status

When the Operational status is black, this indicates the HPEG service is inactive. When the Operational status is purple, activation is in progress. When the Operational status is green, this indicates the HPEG service is active. The application must be properly configured before the Activate button will be available. The HPEG service must be active before the Deactivate button will be available.

Use the Activate button to activate the HPEG service. This will initiate all internal activities needed to prepare the application to support the HPEG service. If you need to reconfigure the HPEG application, deactivate the HPEG service, and then push the Configure button to reconfigure.

4.2.2 HPEG Toolbar

The HPEG toolbar is shown in Figure 5 and Figure 6. When the HPEG service is Inactive, the HPEG Toolbar will not contain any HPEG Status and Configuration information. When the HPEG service is activated, the HPEG Toolbar will display HPEG Status and Configuration information. The HPEG Toolbar also provides the capability to Enable and Disable the HPEG Idle Check. This feature is only available when the HPEG service is active.
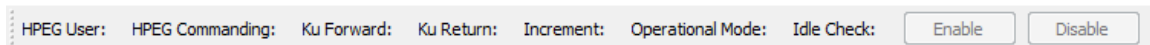

| HPEG User: | HPEG Commanding: | Ku Forward: | Ku Return: | Increment: | Operational Mode: | Idle Check: | Enable | Disable |

Figure 5 HPEG Toolbar

HPEG User: Enabled HPEG Commanding: Enabled Ku Forward: AOS Ku Return: LOS Increment: 41 Operational Mode: Test Idle Check: Enabled Enable Disable
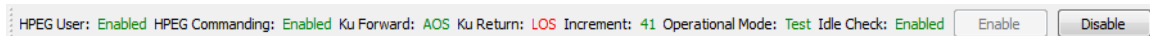
Figure 6 HPEG Toolbar Populated

4.2.3 Ground Node ID Toolbar

The Ground Node ID Toolbar is shown in Figure 7. This toolbar provides quick access to the Ground Node ID. If you do not have a Ground Node ID assigned, this toolbar will not be displayed. The Ground Node ID toolbar is only displayed when the HPEG service is active and a Ground Node ID is in use. If you are authorized to use the DTN service, the Ground Node ID Toolbar will also display DTN configuration information as shown in Figure 8.
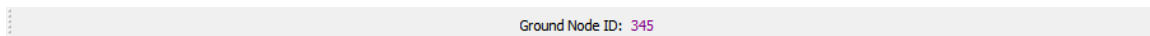

Ground Node ID: 345

Figure 7 Ground Node ID Toolbar

Ground Node ID: 345 HOSC DTN Node Number: 65535 HOSC DTN Node IP Address: 192.168.100.101 HOSC DTN Node Port: 2014
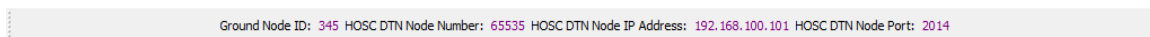
Figure 8 Ground Node ID Toolbar with DTN Configuration Information

5   TReK HPEG Tour

Sometimes it's easier to learn how to use an application by example. This section describes how to activate the HPEG service and obtain a proxy IP address.

This section was written assuming that you have read the Introduction section and the Main Window section. If you have not read these sections, please go back and read them. They contain important information that is not repeated in this section.

If you have a firewall enabled on your computer, you may need to turn it off or allow traffic through for the ports and protocols used in this example.

Please go through the tour in order. Some sections depend on data from previous sections.

How to Activate the HPEG Service and Obtain a Proxy IP Address

5.1 How to Activate the HPEG Service and Obtain a Proxy IP Address

The following steps describe the minimum necessary to activate the HPEG service and obtain a ground proxy IP address. These steps require launching the TReK ERIS Simulation Console application, the TReK HOSC Login application, and the TReK HPEG application. Normally the TReK HPEG application communicates with the Huntsville Operations Support Center. But for training purposes, the TReK ERIS Simulation Console application has been provided to play the part of the HOSC. The configuration that will be used is shown in Figure 9.
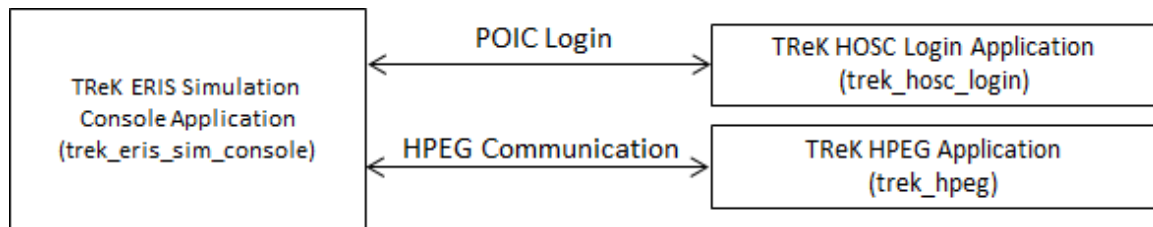

Figure 9 Tutorial Configuration

Note: VPN is required when logging into the HOSC. It is not required for the TReK ERIS Simulation console application.

Step-By-Step

1. First start the trek_eris_sim_console.exe application. To do this, open a command prompt (console window) and navigate to the TReK installation bin directory (normally located under C:\Program Files (x86)\TReK x.x.x\bin) on Windows and /usr/trek-x.x.x/bin on Linux). In the command prompt (console window) type the following:

   > trek_eris_sim_console (Windows)

   >start_trek_eris_sim_console.sh (Linux)

   Note: On Linux, always start a trek executable using the start_trek_<name> script. The script sets environment variables needed for the executable to run correctly.

   If this is the first time you have run trek_eris_sim_console you will see the following message:

Figure 10 trek_eris_sim_console missing config file

The trek_eris_sim_console application reads a configuration file (eris_sim_properties.xml) during application initialization. This configuration file must be located in your home directory. Follow the instructions and copy the eris_sim_properties.xml file to your home directory (normally C:\Users\<username> on Windows and /home/<username> on Linux). Edit the file to replace the "127.0.0.1" address with your local IP address.

2. Start the trek_eris_sim_console application and you should see a window similar to the one shown in Figure 11 with the message: "ERIS Simulator is ready to use. Type in command below (help is a good place to start)…". This indicates the simulator is ready. This is all you need to do with this application. You can minimize this window if you would like.

Figure 11 trek_eris_sim_console ready message

3. If you haven't started the TReK HOSC Login Application, use the operating system's menu to start the application. You should see the HOSC Login main window shown in Figure 12.
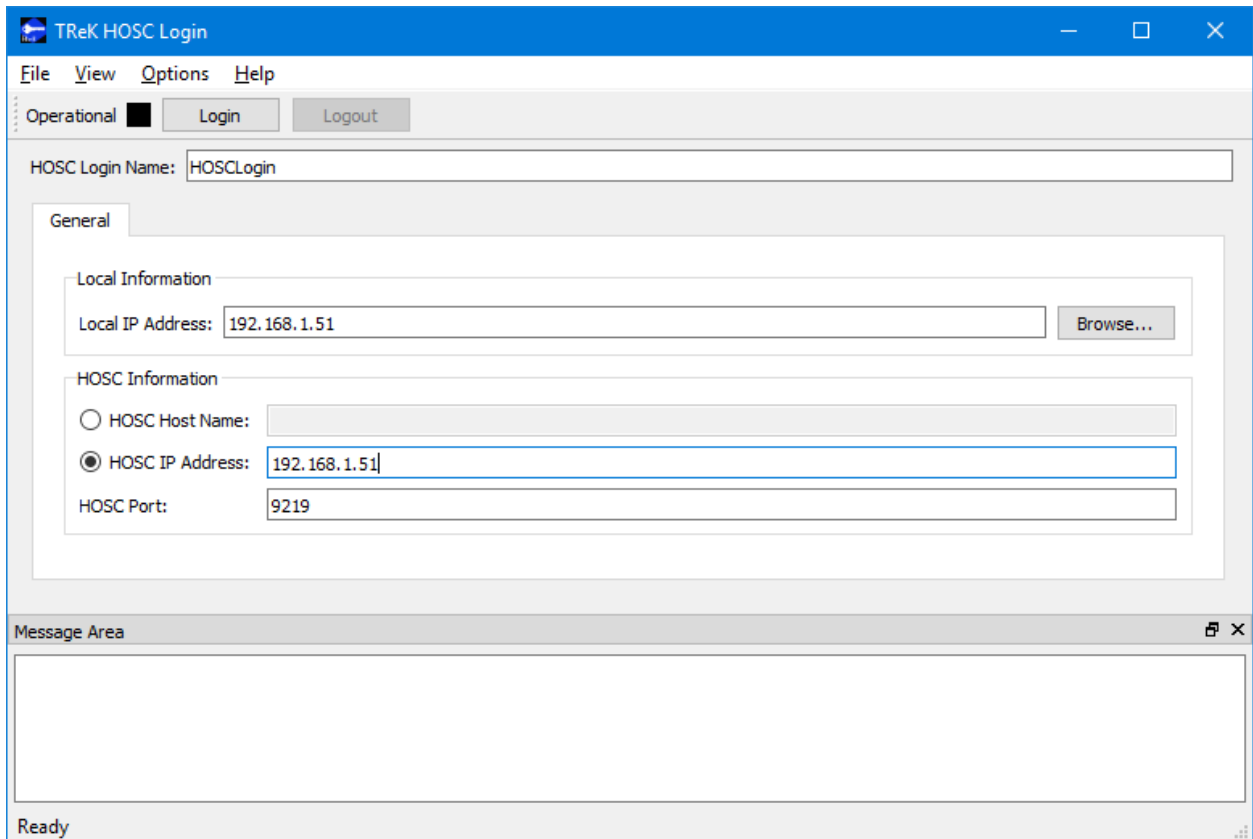
Figure 12 HOSC Login Main Window

4. Enter HOSCLogin in the HOSC Login Name field as shown in Figure 12. Make sure the HOSC IP Address is also set to your local IP address. The HOSC is being simulated by the TReK ERIS Simulation console application which is running on your computer and using the local IP address.

    Important Note: The TReK HOSC Login application and the TReK ERIS Sim Console application use Transport Layer Security (TLS) for all ports except 9209. As of this writing, the HOSC supports non-TLS logins on port 9209 and TLS logins on port 9219. The TReK HOSC Login application stores the last port number you used. So if you have been using port 9209 this will continue to be the default until you change it. The TReK ERIS Sim Console application's eris_sim_properties.xml configuration file contains a port number configuration parameter that controls the port used by the simulator.

5. Next you will push the Login button in the HOSC Login main window configuration toolbar. Please finish reading this step before you push the button. When you activate you will be prompted with a series of dialogs requesting POIC login information. Enter (select) the following information:

Warning Banner: Push the OK Button to Accept
Username: a
Password: b
Passcode: 12345678
Role: Dinner
MOP: ISS:7A1:Flight

Important Note: If the login fails (due to a typing mistake, cancelling out of a dialog, etc.) you must restart the trek_eris_sim_console program. If this happens: no worries. Just restart the trek_eris_sim_console program and then push the 'Login' button in the TReK HOSC Login application to try again. You must restart the console application each time you login or use the HPEG service in the TReK HPEG application.

6. If you haven't started the HPEG Application, use the operating system's menu to start the application. You should see the HPEG main window shown in Figure 13.
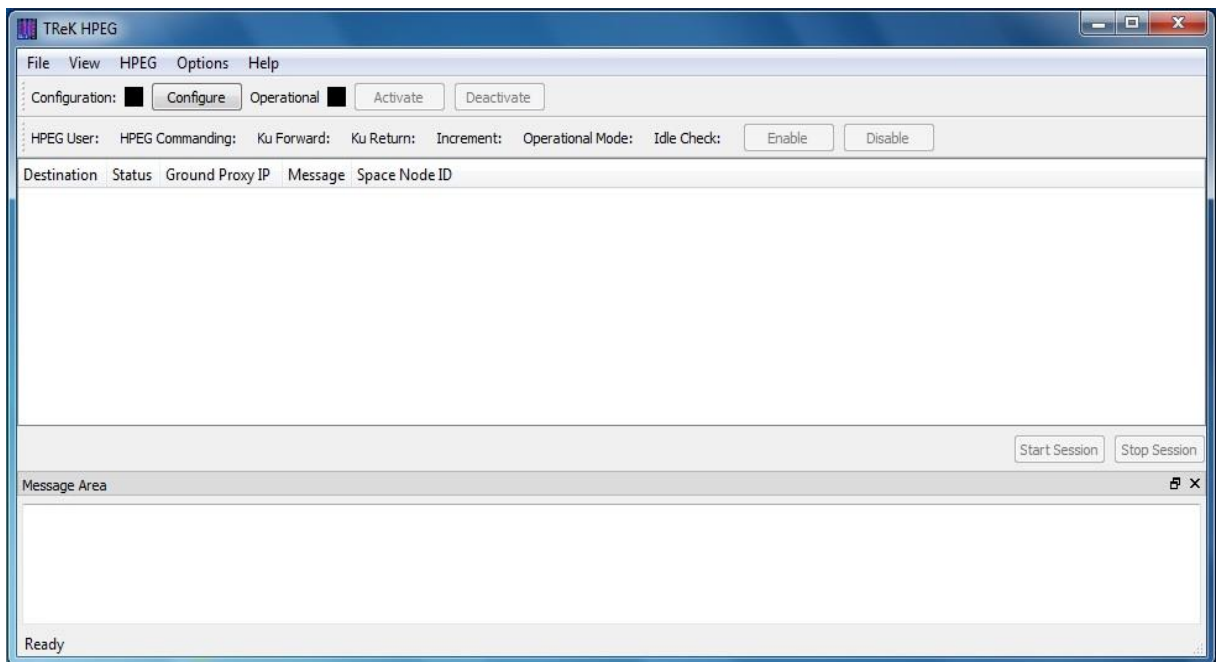

Figure 13 HPEG Main Window

7. In the main window configuration toolbar, push the Configure button. You should see the dialog shown in Figure 14.
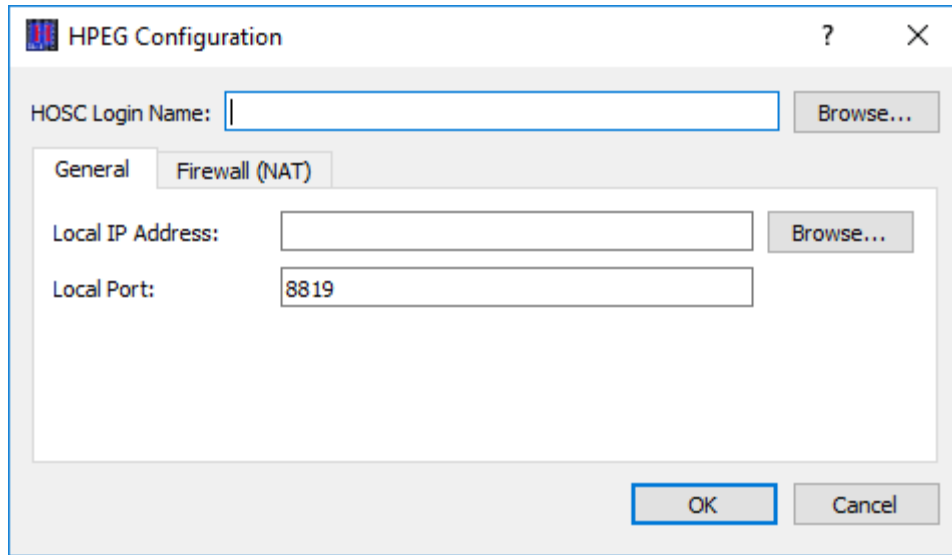
Figure 14 HPEG Configuration Dialog

8. In the HPEG Configuration dialog use the Browse button to select the HOSCLogin session and verify the Local IP Address is correct.

   Note: If you don't see any items in the Browse dialog, be sure you have a valid active Login session that you created using the TReK HOSC Login application.

9. If the application is configured correctly, the Configuration status in the main window will be green as shown in Figure 15. If you do not see green, the most likely problem is the local IP address. Verify that you have entered a valid local IP address for your computer.
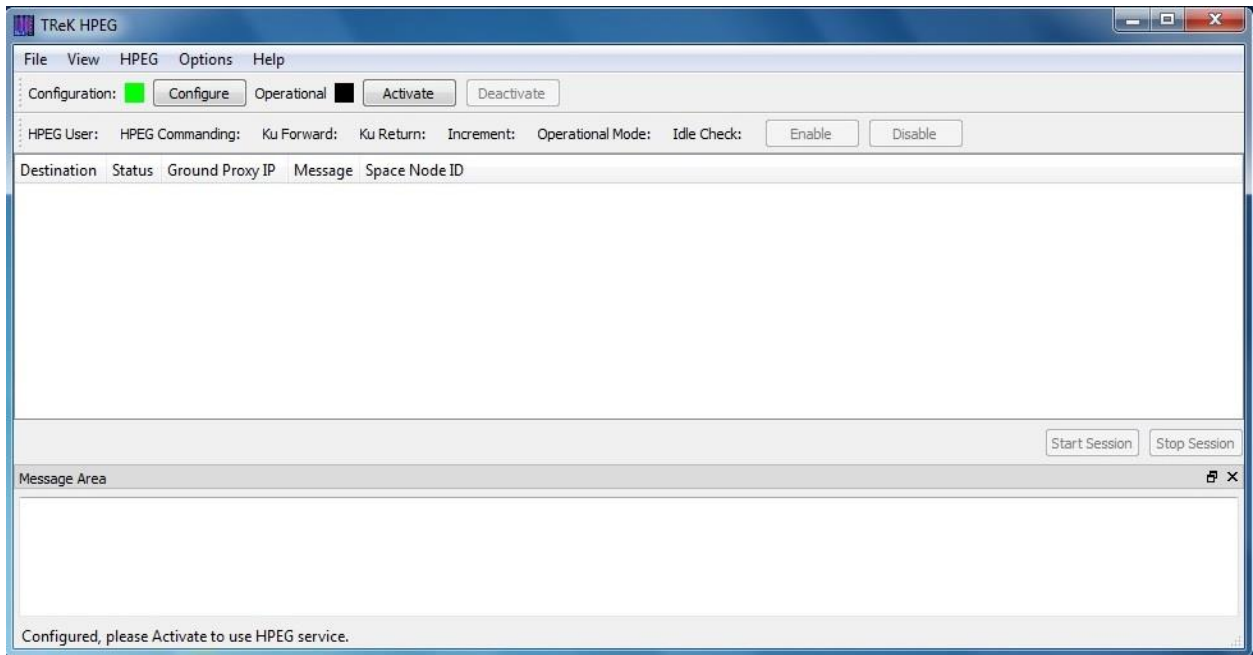
Figure 15 Configuration Status

10. Push the Activate button in the main window configuration toolbar. When you activate you will be prompted for a Ground Node ID. Enter (select) the following information:

    Ground Node ID: 345

    Ground Node ID Note
    The Ground Node ID is a unique ID assigned to a ground node. If you requested to use the CFDP service or the DTN service in your Payload Integration Agreement, you will be prompted to select a Ground Node ID during the activation sequence. If you did not request the CFDP service or the DTN service you will not have a ground node ID and you will not be prompted.

    If activation is successful, your main window should look like the one shown in Figure 16. The Operational Status will be green and there will be two destinations listed in the Destination list. Note the HPEG toolbar. It is now populated with Configuration and Status information such as HPEG Commanding status, Ku Forward status, and Ku Return status. The Space Node ID column for the 'SomewhereOverTheRainbow' destination contains 2001. The Space Node ID is a unique ID assigned to the payload onboard. It is used with the CFDP service and the DTN service. If you requested to use CFDP or DTN in your Payload Integration Agreement, you will see a Space Node ID. If you did not request CFDP or DTN, the Space Node ID field will be empty. If you selected a Ground Node ID, you will see

14

the Ground Node ID toolbar with your selection.   When authorized to use the DTN service, the Ground Node ID toolbar also shows DTN configuration information.
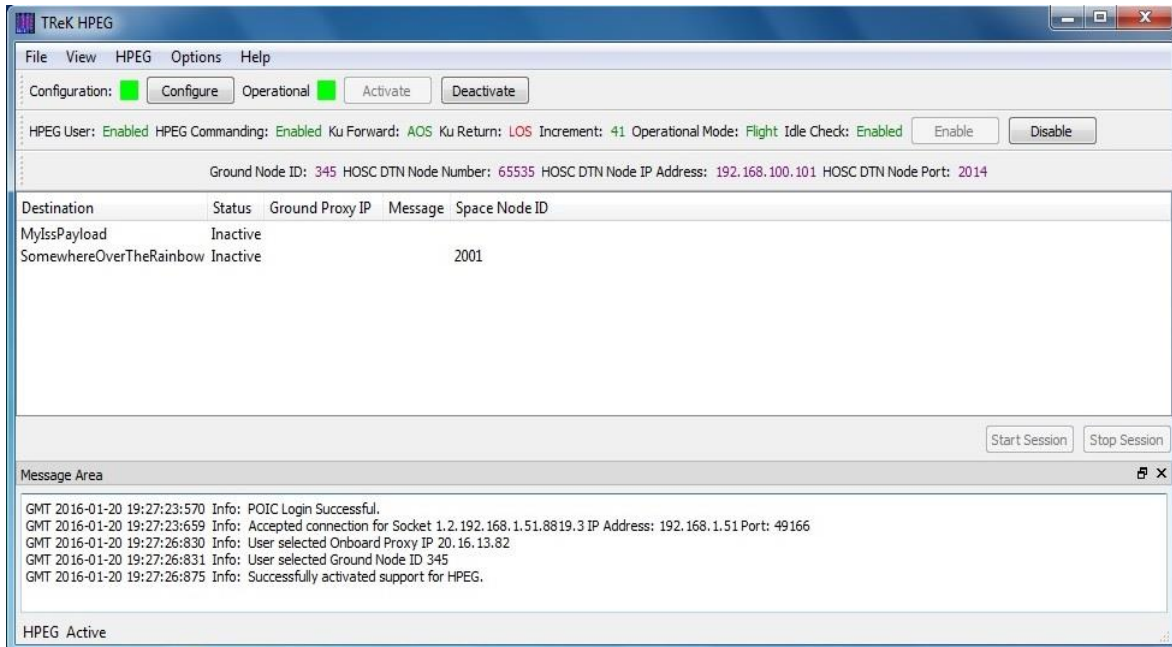

Figure 16 HPEG Active

11. All the destinations show a status of Inactive. It's time to start a session with a destination. Select the 'MyIssPayload' destination. The 'Start Session' button will be available. Push the 'Start Session' button. The main window should look like the one shown in Figure 17. The 'MyIssPayload' status will show 'Active', you will see an IP address in the Ground Proxy IP column, and the Message column will indicate the session was successfully initialized.
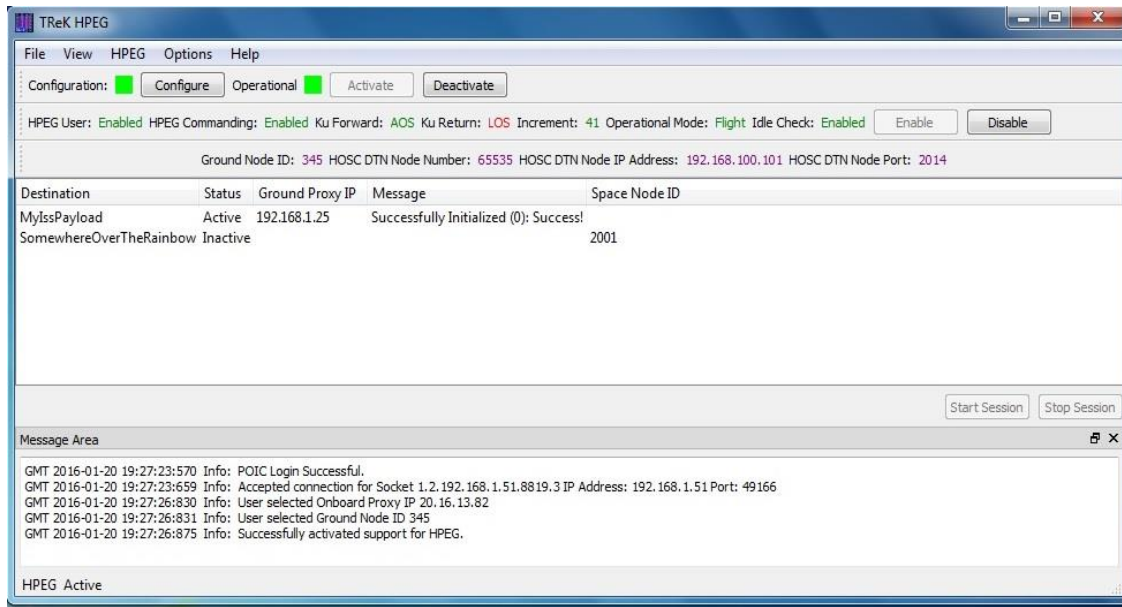
Figure 17 Active Destination

The address shown in the Ground Proxy IP column is the Ground Proxy IP address. This is the IP address you will use to communicate with the 'MyIssPayload' destination onboard ISS. It is called a Ground Proxy IP address because it is a substitute address for the real IP address of the 'MyIssPayload' payload onboard the ISS. Real IP addresses are hidden for security purposes.

12. Next open a Command Prompt (console window). Type in the following:

    >ping 192.168.1.25

    Note: This will not work. The ping will fail. However, if you had a real HPEG session and the 'MyIssPayload' destination was onboard ISS, this would work. The ping would result in several successful replies. The purpose of this step was to describe one of the typical steps that one could take next when using the HPEG service. At this point you could also use other services such as ssh, CFDP, remote desktop, etc.

13. Next select the 'MyIssPayload' destination and push the 'Stop Session' button. This will deactivate the session with the 'MyIssPayload' destination. The main window should look like the one in Figure 18.
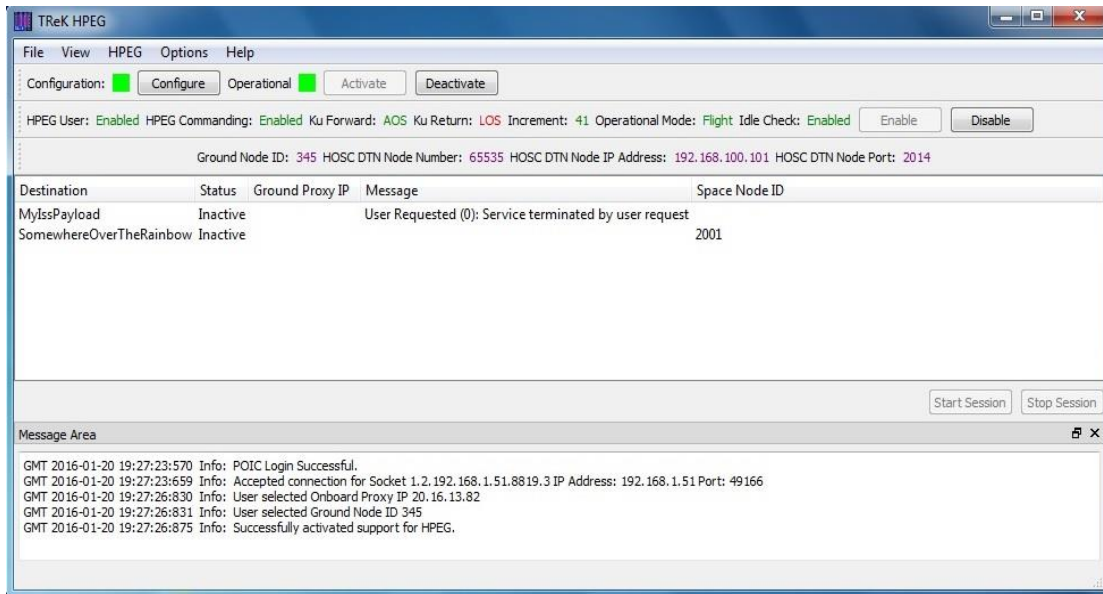
Figure 18 Inactive Destination after Stop Session

14. Next select 'Deactivate' in the main window configuration toolbar. This will deactivate the HPEG service. The main window should look like the one shown in Figure 19. You may notice the Ground Node ID toolbar is gone. This is because the Ground Node ID toolbar is only displayed when the HPEG service is active and a Ground Node ID is in use.
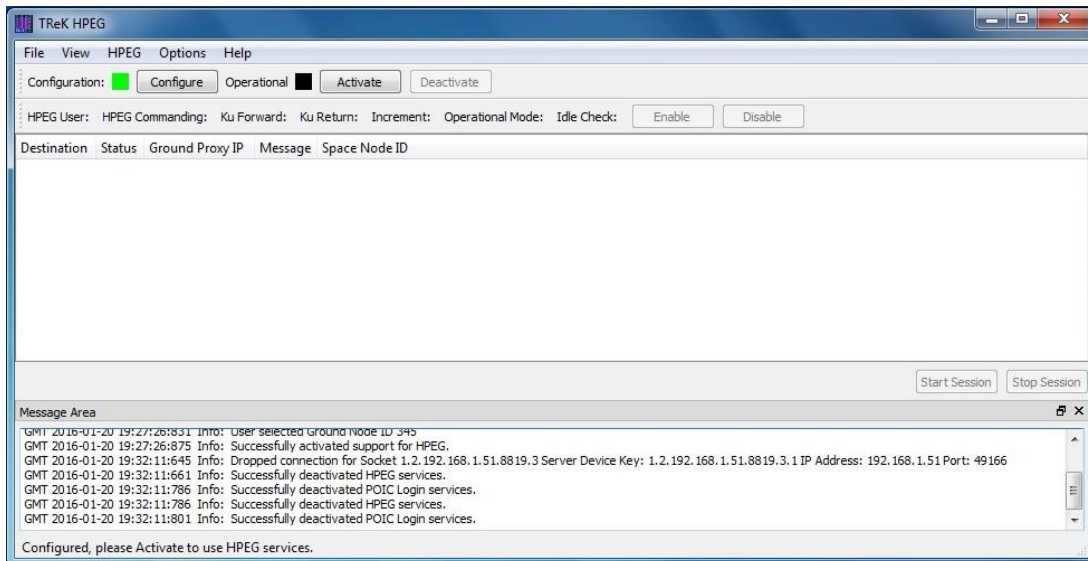

Figure 19 HPEG Deactivated

Note: Remember if you want to activate again, don't forget to restart the trek_eris_sim_console application. You will need to login again using the TReK HOSC Login application and activate the HPEG service.

That's it! Now you know how to use the HPEG service. For more information please see the TReK HPEG User Guide.